PATENT

NONPROVISIONAL APPLICATION FOR LETTERS PATENT
UNITED STATES OF AMERICA

Be it known that I, **GREGORY B. ARASMITH**, residing at, **6152 Big Texas Valley Road, Rome, Georgia 30165** being a citizen of the United States, have invented certain new and useful improvements in an --

ARROW BROADHEAD

of which the following document is a specification.

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ARROW BROADHEAD

CROSS-REFERENCE TO RELATED APPLICATIONS

To the fullest extent permitted by law, the inventor hereof claims priority to and full benefit of United States nonprovisional patent application serial number 10/120,666 filed April 4, 2002, which claims priority to and full benefit of United States provisional patent application serial number 60/333,902 filed November 28, 2001 and United States provisional patent application serial number 60/283,679 filed April 12, 2001.

TECHNICAL FIELD

The present invention relates generally to arrowheads for use in bow-and-arrow target shooting and hunting; and, more specifically, to an improved broadhead-type arrowhead having superior flight and performance characteristics achieved through the use of curved blades of increasing width as measured from the leading edge thereof to the central axis of the arrowhead, wherein the broadhead-type arrowhead cooperatively functions with a bearing insert to

facilitate independent rotation thereof with respect to the arrow shaft.

BACKGROUND OF THE INVENTION

The use of a bow and arrow in lieu of a rifle, shotgun, or the like, in the hunting of game has become increasingly popular in recent years. Many of the game hunters practicing bow and arrow hunting have found the use of a broadhead-type arrow achieves more efficient results, particularly in the hunting of relatively large game. The usual presently available broadhead-type arrow has certain disadvantages in that the speed, distance, and the accuracy of flight of the arrow shaft through the air is frequently adversely affected by the structural configuration of the arrowhead. In addition, there are certain legal requirements setting forth the conditions under which the use and structure of the broadhead-type arrows must comply.

Many attempts have been made to solve the problems encountered with the use of the broadhead-type arrow, such as shown in the Chandler U.S. Pat. No. 2,289,284, issued July 7, 1942, and entitled "Interchangeable Arrowhead;"

Recker U.S. Pat. No. 2,753,643, issued July 10, 1956, and entitled "Fishing Arrow;" Grissinger U.S. Pat. No. 2,937,873, issued May 24, 1960, and entitled "Hunting Head for an Arrow or the Like;" Richter U.S. Pat. No. 2,940,758, issued June 14, 1960, and entitled "Arrowhead;" Yurchich U.S. Pat. No. 3,014,305, issued Dec. 26, 1961, and entitled "Arrowhead for Bow Fishing;" Swails U.S. Pat. No. 3,036,396, issued May 29, 1962, and entitled "Retractable Arrow;" McKinzie U.S. Pat. No. 3,138,383, issued June 23, 1964, and entitled "Dual Purpose Arrow Head;" Lint U.S. Pat. No. 3,168,313, issued Feb. 2, 1965, and entitled "Hunting Arrowhead with Retractable Barb;" and Hendricks U.S. Pat. No. 3,600,835, issued Aug. 24, 1971, and entitled "Spear Head with Swingable Barb." Other configurations are also known.

Most prior art broadheads have straight blades in-line with the arrow shaft, and rotate fixedly with the arrow shaft in flight until they come in contact with the target. Specifically, standard fixed inserts for receiving broadheads are designed to be glued into a tubular arrow shaft. Such inserts have internal threads, so that the broadhead, or other types of practice and hunting arrow

tips, can be utilized and interchanged. Once the broadhead has been screwed into the insert, the broadhead is fixed or stationary, and thus, rotates only as the arrow rotates in flight. Disadvantageously, when such fixed broadheads impact or contact the target, the arrow as a whole is forced to stop spinning, tears the target upon entry, and thereafter cuts straight through the target without the assistance of any rotational force or inertia, thereby significantly and detrimentally reducing the overall efficiency of the penetrating and cutting action.

Although broadheads having curved blades are available, such broadheads typically possess a pitch too great or too small to effectively penetrate the targeted medium, or often contribute to the skewed flight and/or trajectory of an arrow equipped therewith. More specifically, although a curved-blade broadhead having a large pitch corresponds to an equally large linear displacement of the broadhead through a targeted medium, arrows equipped with such broadheads often experience large deviances from the expected path of trajectory; that is, the expected flight path of the arrow is largely skewed from the selected target, especially when traveling over a

relatively substantial distance. Alternatively, although curved-blade broadheads having a small pitch may contribute to a more desirable or expected flight path or trajectory over a selected distance, such broadheads are typically unable to effectively penetrate the targeted medium to a desirable depth; that is, the linear displacement of the broadhead through a targeted medium is accordingly reduced. Examples of such curved-blade broadheads may be seen with reference to Brozina U.S. Pat. No. 3,604,708, issued September 14, 1971, and entitled "Serpentine Arrowhead;" Schaar U.S. Pat. No. 4,533,146, issued August 6, 1985, and entitled "Arrow and Components Thereof;" Carrizosa U.S. Pat. No. 5,257,809, issued November 2, 1993, and entitled "Detachable Rotary Broadhead Apparatus Having Drill Bit-like Characteristics;" and, Martinez et al. U.S. Pat. No. 6,319,161, issued November 20, 2001, and entitled "Arrowhead and Method of Making."

Additionally, although rotational inserts or bearing assemblies are available to assist in providing independent rotational movement of the broadhead relative to the arrow shaft when the arrow is in flight, such rotational inserts typically involve overly complex bearing systems that

require unduly burdensome assembly for implementation and utilizations of same. Specifically, most bearing assemblies require the user to glue or otherwise adhesively affix a stationary bearing housing within the arrow shaft, and subsequently insert therethrough a bearing insert, or series of bearing inserts and/or surfaces, typically retained within the bearing housing via lock washers, curved washers, retaining clips, pins, interlocking channel-and-groove assemblies, combinations thereof, and the like. Of particular concern when assembling such bearing systems is the potential for accidentally or unknowingly gluing or adhesively affixing rotational components of the bearing system to fixed components therein, or to the inside of the arrow shaft. For instance, insertion of the bearing housing, or other similar components, into the arrow shaft inherently exerts pressure on the glue, and thus, may push the glue upward and out of the shaft end, and/or downward into areas that may come into contact with the rotational inserts and related components; thus, affixing same upon insertion therein. Although some types of glue may be reheated to release the bonding capabilities thereof, to permit subsequent reassembly of the bearing system, such a task is

often burdensome, overly messy, time consuming, and potentially deleterious to the arrow assembly. Examples of such bearing systems may be seen with reference to Sprandel U.S. Pat. No. 3,910,579, issued October 7, 1975, and entitled "Swivel-Mounted Hunting Arrowhead;" Schaar U.S. Pat. No. 4,533,146, issued August 6, 1985, and entitled "Arrow and Components Thereof;" Tone U.S. Pat. No. 4,534,568, issued August 13, 1985, and entitled "Archery Arrow With Freely Rotational Broadblade Arrowhead To Avoid Windplanning;" Winters U.S. Pat. No. 4,671,517, issued June 9, 1987, and entitled "Apparatus for Rotatably Mounting Arrowheads;" and, Carrizosa U.S. Pat. No. 5,257,809, issued November 2, 1993, and entitled "Detachable Rotary Broadhead Apparatus Having Drill Bit-Like Characteristics."

Furthermore, apparently absent from the prior art is a bearing insert and assembly adapted to interchangeably receive a selected arrowhead, yet provide the requisite protection for the end of the arrow shaft to prevent cracking, splitting or damage to same when the arrow and arrowhead ricochets off of or otherwise impacts a target or surrounding surface. Also absent from the prior art is a

broadhead having an optimized pitch to interface rotatably with such a bearing insert and assembly.

Accordingly, it would be advantageous to provide a broadhead-type arrowhead having superior flight, penetration and performance characteristics achieved through the use of pitch-optimized spiral-shaped, curving or twisting, blades of increasing width as measured from the leading edge thereof to the central axis of the arrowhead. It would be further advantageous to provide a broadhead-type arrowhead for use in association with a bearing assembly or insert to provide independent broadhead rotation with respect to the arrow shaft, wherein assembly of the bearing insert may be implemented without occurrence of the above-discussed disadvantages, and wherein the bearing assembly further functions to protect the end of the arrow shaft from cracking, splitting or damage resulting from in-flight impact against an object.

BRIEF SUMMARY OF THE INVENTION

Briefly described, in a preferred embodiment, the present invention overcomes the above-mentioned

disadvantages and meets the recognized need for such a device by providing an improved arrowhead design which includes pitch-optimized spiral-shaped, curving or twisting, blades of increasing width as measured from the leading edge thereof to the central axis of the arrowhead. The curved blades of the arrowhead provide the arrowhead with a desirable pitch that effectively promotes true-flight, enhanced and more forceful target penetration, and stable and predictable flight path. Additionally, a bearing insert, retained within the arrow shaft via an outer retaining cap, is utilized to support the arrowhead at the end of the arrow shaft. The bearing insert further permits independent rotation of the arrowhead relative to the arrow shaft, wherein the rotation of the arrowhead is preferably substantially along the longitudinal axis of the shaft. Although the outer retaining cap effectively functions to securely retain the bearing insert within the arrow shaft, it equally importantly functions to protect the end of the arrow shaft from potential cracking, breaking, splintering, denting, or other damage, to which the arrow would otherwise be subject to upon forceful impact or collision with trees, rocks, bones, or other solid surfaces when in flight.

The bearing insert of the present invention preferably enables the broadhead-type arrowhead to rotate at a differing rate during flight from the arrow shaft rotation; and, further, upon impact with the target, allows the broadhead to continue in its rotation to penetrate a substantial distance into the target. Such characteristics are facilitated by the spiral-shaped, or twisting, nature of the blades. Advantageously, the above characteristics are provided without the broadhead becoming detached or partially unscrewed from the bearing insert. It is contemplated in an alternate embodiment that an arrowhead having removable or replaceable spiral-shaped, curving or twisting, blades could be utilized in conjunction with the rotating bearing insert of the present invention.

Assembly of the bearing insert requires that the user simply place the insert into the arrow shaft, apply a thin film of adhesive to the exterior of the shaft, proximal the end retaining the bearing insert, and slide the retaining cap thereover. No bearing housing, or series of bearing inserts or structures, is required, nor is the use of washers, clips, pins, or the like to retain the bearing insert therewithin. Additionally, unlike conventional

practice of applying glue to the interior of the shaft, the present system requires that glue, or other suitable adhesives, be placed on the exterior of the shaft, thus preventing accidental gluing of the bearing insert to the inside of the arrow shaft, or other fixed components.

Accordingly, a feature and advantage of the present invention is its ability to overcome the deficiencies in prior art broadhead arrowheads by providing an improved arrow broadhead in accordance with the disclosure herein.

Another feature and advantage of the present invention is its ability to provide an improved arrow broadhead.

Yet another feature and advantage of the present invention is its ability to provide an improved arrow broadhead having improved cutting characteristics.

Still another feature and advantage of the present invention is its ability to provide an improved arrow broadhead having improved flight characteristics.

A further feature and advantage of the present invention is its ability to provide an improved arrow broadhead having improved accuracy characteristics.

Still a further feature and advantage of the present invention is its elimination of conventional bearing assemblies and components, and associated methods of assembly and implementation.

Still yet another feature and advantage of the present invention is its ability to provide a bearing insert and assembly adapted to interchangeably receive a selected arrowhead, yet provide the requisite protection for the end of the arrow shaft to prevent cracking, splitting or damage to same when the arrow and arrowhead ricochets off of or otherwise impacts a target or surrounding surface.

These and other features and advantages of the present invention will become more apparent to one skilled in the art from the following description and claims when read in light of the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be better understood by reading the Detailed Description of the Preferred and Alternate Embodiments with reference to the accompanying drawing figures, in which like reference numerals denote similar structure and refer to like elements throughout, and in which:

FIG. 1 is a side view of a one piece broadhead of the present invention according to a preferred embodiment thereof;

FIG. 2 is an end view of the broadhead of the present invention according to a preferred embodiment thereof, taken from the tip and showing the blades, tip, chisel flats, and aerodynamic cut-out areas of same;

FIG. 3 is an end view of the broadhead of the present invention according to a preferred embodiment thereof, taken from the arrow shaft toward the direction of flight;

FIG. 4 is a cross-sectional side view of a bearing insert and retaining cap of the present invention according to a preferred embodiment thereof;

FIG. 5 is an exploded perspective view of an arrow shaft, bearing insert, retaining cap, and broadhead of the present invention according to a preferred embodiment of thereof;

FIG. 6 is a side view of an alternate embodiment of the broadhead of the present invention showing the shaft of the broadhead, tip, and groove;

FIG. 7 is a side view of the alternate embodiment of the broadhead of **FIG. 6** showing a removable blade, lug, and hook; and,

FIG. 8 is a partial side view of the alternate embodiment of the broadhead of **FIG. 6** showing one blade and the retainer.

DETAILED DESCRIPTION OF THE PREFERRED AND SELECTED ALTERNATE EMBODIMENTS

In describing the preferred and selected alternate embodiments of the present invention, as illustrated in **FIGS. 1-8**, specific terminology is employed for the sake of clarity. The invention, however, is not intended to be limited to the specific terminology so selected, and it is to be understood that each specific element includes all technical equivalents that operate in a similar manner to accomplish similar functions.

Referring now to **FIGS. 1-3**, in a preferred embodiment, broadhead **10** comprises tip **12** which is pointed on the end and which, optionally, may have a plurality of chisel flats **20** or which may simply be conical in shape. Tip **12**, shaft **30**, journal **40**, threads **50**, and blades **60** may be formed as one integral unit. Blades **60** are also preferably formed as one piece with shaft **30** and the other previously mentioned elements. Broadhead **10** is preferably integrally formed from titanium metal; however, it is contemplated in an alternate embodiment that other suitable metals could be utilized, and/or that select portions of broadhead **10** could

each be formed from different metals, wherein such metals could include, but are limited to, steel, aluminum, brass, carbon-graphite, boron, or other suitable metals or metal alloys.

Blades **60** comprise cutting edges **65**. The cutting width of blades **60** is small near tip **12** and gradually increases rearwardly toward threads **50** along a leading edge of the blade, as taken in view of the direction of flight. That is, blades **60** preferably comprise an increasing width as measured from the leading edge thereof to the central axis of broadhead **10**. Maximum cutting width may be achieved at the rearmost portion of blade **60**, or may be achieved intermediate the blade length.

Blades **60** preferably comprise a spiral, curved, or twisted shape, curving from front to rear taken in the direction of flight. As such, broadhead **10** preferably comprises a pitch of approximately 11.3, which corresponds to broadhead **10** having a linear translation or displacement of approximately 11.3 inches upon one full rotation thereof. That is, one complete, uninterrupted rotational cycle of broadhead **10** effectively results in broadhead **10**

traveling a total linear distance of 11.3 inches through the targeted or selected medium. Advantageously, the curves of blades **60** preferably enhance and promote true flight by imparting a rifling aerodynamic to broadhead **10,** thereby facilitating penetration of the targeted medium. Each blade **60** further preferably includes cut relief **70,** and an aerodynamic cut-out area **80,** both of which reduce the weight and aerodynamic drag of broadhead **10.** Additionally, each blade **60** also comprises downwardly tapered area or wind-deflector **82** formed at the base of cut-out area **80,** wherein wind-deflector **82** preferably functions to reduce the aerodynamic drag of broadhead **10** by angularly deflecting wind passing through cut-out area **80** when broadhead **10.** Broadhead **10** preferably has at least two blades **60,** with three such blades being preferred.

With reference to **FIGS. 6-8,** in an alternate embodiment, shaft **130** provides undercut **144** immediately adjacent the rear of point **12.** Shaft **130** also has a plurality of equally spaced grooves **140,** parallel to the axis of flight and equal to the number of blades **180** used.

Blades **180** provide hook **150** proximate their forward end, hook **150** being of suitable configuration such that undercut **144** will retain the forward end of blades **180.** Inboard edge **155** of blades **180** fit into groove **140.** Proximate rear end of blades **180** is protruding lug **160,** which is configured so that retainer **170** may snap over lug **160** and, thereby, hold blades **180** to shaft **130.**

Blades **180** share many features with the preferred embodiment of **FIGS. 1-3**, including, but not limited to: a spiral-shaped, or twisting, curve of increasing width as measured from the leading edge thereof to the central axis of broadhead **10**, tip **12** comprising optional chisel flats **20**, threaded portion **50**, journal **40**, based **45**, cut relief **70**, and aerodynamic cut-out area **80**. With the configuration of this embodiment, blades **180** may be quickly and easily replaced while hunting or otherwise.

Referring now to **FIGS. 4-5**, illustrated therein is bearing assembly **100** designed to be utilized with any broadhead, whether of prior art configuration or of the configuration of the several embodiments of the present invention.

Specifically, bearing assembly **100** preferably comprises bearing insert **102** and retaining cap **150**, each preferably formed from anodized aluminum metal, thereby increasing the structural integrity and strength of same, and facilitating bearing surface interaction therebetween, as more fully described below. Although bearing insert **102** and retaining cap **150** are preferably formed from anodized aluminum metal, it is contemplated that other suitable, lightweight, anodized or non-anodized metals could be utilized, such as, for exemplary purposes only, steel, brass, boron, and/or other suitable metals or metal alloys. It is further contemplated that suitable non-metals, such as carbon-graphite, could also be utilized to fabricate bearing insert **102** and retaining cap **150**.

Bearing insert **102** is preferably substantially cylindrical-shaped, and comprises first end **104**, second end **106**, inner relief **108**, and inner threaded region **110** formed in communication with inner relief **108**. Additionally, outer flanged portion **112** is preferably disposed proximal to first end **104**, and preferably comprises first peripheral edge **112a** and second peripheral edge **112b**, wherein first peripheral edge **112a** assists in retaining bearing insert

102 within retaining cap **150**, and functions as a bearing surface therewithin, as more fully described below. Moreover, upon insertion of bearing insert **102** into the arrowhead receiving end of arrow shaft **S**, second peripheral edge **112b** of flanged portion **112** functions as a "stop" thereagainst, and provides the requisite interactive bearing surface therewith.

Preferably, retaining cap **150** is substantially cylinder-shaped and comprises first end **152** and second end **154**, wherein inner flanged portion **156** is preferably formed at first end **152** and thus, defines aperture **158**. Second end **154** of retaining cap **150** is preferably tapered or beveled to facilitate aerodynamic termination of same. Although retaining cap **150** effectively functions to securely retain bearing insert **102** within arrow shaft **S**, retaining cap **150** equally importantly functions to protect the end of arrow shaft **S** from potential cracking, breaking, splintering, denting, or other damage, experienced by the arrow upon forceful impact or collision with trees, rocks, bones, or other solid surfaces when in flight.

Upon inserting second end **106** of bearing insert **102** into arrow shaft **S**, and flushly seating peripheral edge **112b** of flanged portion **112** thereagainst, retaining cap **150** is preferably placed or inserted over bearing insert **102** via second end **154** thereof, wherein a sufficient amount of glue **G** is placed onto the exterior of the end of arrow shaft **S** to securely adhere retaining cap **150** thereto. In such a configuration, a bearing surface is preferably established between flanged portion **112** of bearing insert **102** and inner surface **151** of retaining cap **150**. Moreover, peripheral edge **156a** of inner flanged portion **156** of retaining cap **150** preferably abuts first peripheral edge **112a** of outer fanged portion **112** of bearing insert **102**; thus, creating a bearing surface therebetween. In addition thereto, first end **104** of bearing insert **102** extends fractionally through aperture **158** of retaining cap **150**, thereby facilitating bearing interaction between first end **104** and peripheral wall **156b** of inner flanged portion **156** of retaining cap **150**. As more fully described below, bearing surface interaction between retaining cap **150** and bearing insert **102** preferably permits rotational movement of broadhead **10** when threadably engaged therewith.

More specifically, to provide broadhead **10** with the desired rotational movement, threaded portion **50** of broadhead **10** is preferably inserted through first end **104** of bearing insert **102**, and subsequently fully threadably engaged with inner threaded region **110**. As a result thereof, journal **40** resides substantially within inner relief **108** of bearing insert **102**, and peripheral edge **104a** of first end **104** of bearing insert **102** preferably abuts base **45** of broadhead **10**.

In order to securely tighten or thread broadhead **10** into bearing insert **102**, it is necessary to temporarily "fix" bearing insert **102** relative to retaining cap **150**. As such, flanged portion **112** of bearing insert **102** preferably possesses diametrically disposed throughholes **114** and **116** formed therethrough, wherein throughholes **114** and **116** preferably align with diametrically disposed throughholes **160** and **162**, respectively, formed through retaining cap **150** when bearing insert **102** is engaged therewith. A pin **P** is preferably inserted through the aligned throughholes to prevent relative rotational movement of same. Once broadhead **10** is securely fastened to bearing insert **102**, pin **P** may be withdrawn. Advantageously, due to the

rotational characteristics of bearing assembly **100**, blades **60** do not need to be aligned with the fletchings of arrow shaft **S** while securing broadhead **10** thereto, as is typically the case with conventional fixed broadheads. Bearing assembly **100** allows arrow shaft **S** and broadhead **10** to spin at differing relative rates of rotation during flight and, also, allows broadhead **10** to continue spinning after impact with a target. Such a configuration further allows the arrow to fly with more accuracy, and allows broadhead **10** to penetrate the intended target more effectively.

Preferably, improved flight characteristics will be achieved by virtue of insert **100** functioning in association with a pitch optimized broadhead **10** (i.e., or other selected broadhead) by providing broadhead **10** with independent rotation relative to the arrow shaft. As a further advantage, the user will not have to adjust bow sights as often, because of truer flight.

It is contemplated that bearing insert **100** could alternatively comprise needle or ball-type bearings. It will be apparent to those ordinarily skilled in the art

that sleeve bearings, sintered metal bearings, simple clearance and lubrication arrangements, or the like could also be used within the contemplation of the present invention. Without regard to the specific type of bearing selected, the application and advantages thereof remain the same. It is noted as a design constraint, however, that the bearing should not allow a large relative longitudinal movement between the arrow shaft and the arrowhead.

It is further contemplated that bearing assembly **100** could be manufactured to fit all arrow shaft sizes and, preferably, will glue onto the arrow as described above. The benefit of bearing assembly **100** of the present invention is that once the arrowhead has been screwed into bearing insert **102**, the arrow is able to rotate in either direction without becoming unscrewed. It should be recognized that bearing insert **102** of the present invention also accommodates different broadhead designs and fletching pitches.

As described above, broadhead **10** is preferably formed from titanium metal and is cast or otherwise formed as an integral unit, so as to be stronger and more durable than

other broadheads currently on the market. Preferably, broadhead **10** will weigh approximately 100 to 125 grains, such weight being the most popular amongst hunters.

Additional modifications and other embodiments of the invention may become apparent to one skilled in the art to which this invention pertains having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. It is to be understood, however, that the invention is not to be limited to the specific embodiments disclosed. It is further to be understood that modifications and other embodiments are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.